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A PRESSURE-SENSITIVE ADHESIVE FILM

[*Nen'chaku fuirumu*]

Applicant: Mitsui Toatsu Chemical Corp.
2-5, 3-chome
Kasumigaseki
Chiyoda-ku, Tokyo

has dimensions

Inventors:

Jun'ichi Tohsei
5 banchi, Takiharu-cho
Minami-ku, Nagoya-shi

Shin Hosonuma
49-2 Ikuyama Aza
Urazama Oaza, Arimatsu
cho, Midori-ku
Nagoya-shi

Hiroshi Makiguchi
124-15F-14-5 Tsutsumi
Igasaki-shi

[*There are no amendments to this patent.*]

Specification

1. Title of the invention

A pressure-sensitive adhesive film

2. Claims of the invention

A pressure-sensitive adhesive film structure consisting of a release film, a pressure-sensitive adhesive layer, and a base film, in which the pressure-sensitive adhesive film is characterized by the fact that the above-mentioned release film is a synthetic resin film embossed with continuous raised lines having a height of 1~15 μm.

3. Detailed description of the invention

The present invention pertains to a pressure-sensitive adhesive film and the invention further pertains to a pressure-sensitive adhesive film suitable for optical applications.

Historically, pressure-sensitive adhesive films used for optical applications have a structure consisting of a base film, a pressure-sensitive adhesive layer, and release film, and upon application, the pressure-sensitive adhesive film is cut to the desired shape, the release layer is removed, and the film is applied to the object. In general, a synthetic resin film having a smooth surface is used for the above-mentioned release layer, and the adhesive surface of the pressure-sensitive adhesive layer is flattened; thus, when the film is applied in intimate contact, an adhesive surface having excellent optical properties can be produced. However, in many cases, air is likely to be trapped on the adhesive surface unless appropriate application conditions are used, and removal of the trapped air is very difficult once the film is applied.

The present inventors carried out considerable research into methods capable of preventing entrapment of air at the time of application of a pressure-sensitive adhesive film to a bonding object, and as a result of their effort, they discovered that the high smoothness of the adhesive surface of conventional pressure-sensitive adhesive films is a problem, and further study lead to the present invention.

[*Translator's note: the text shown in boxes below is enclosed in hand-drawn boxes in the source document.*]

In other words, the present invention is a pressure-sensitive adhesive film structure consisting of a release film, a pressure-sensitive adhesive layer, and a base film, and the pressure-sensitive adhesive film is characterized by the fact that the above-mentioned release film is a synthetic resin film embossed with continuous raised lines with a height of 1~15 μm.

For the release layer used in the present invention, a synthetic resin film commonly used as a release layer can be used in this case, as well, and, furthermore, it is desirable when the release surface is treated with silicon.

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In the present invention, it is essential for the entire surface of the above-mentioned release surface to be embossed so as to form continuous raised lines with a height of 1~15 μm, preferably 2~10 μm. The above-mentioned continuous lines are transferred to the adhesive surface of the pressure-sensitive adhesive film (the surface that adheres to the bonding object) so as to form continuous recessed lines. Entrapment of air can be prevented by the above-mentioned recessed lines (channels) at the time of application of the film, and removal of the entrapped air [if any] can be easily achieved. When the above-mentioned height of the raised lines is less than 1 μm, the effect achieved is insignificant; on the other hand, when the height exceeds 15 μm, air is trapped by the pressure-sensitive adhesive (adhesive) layer, distortion of the pressure-sensitive adhesive layer occurs, which causes problems when used in optical applications. With regard to the pattern of the emboss, it is not especially limited as long as continuous lines are formed. And specific examples are shown in Fig. 1~Fig. 3. The lines in these figures represent the raised portions.

As for the types of pressure-sensitive adhesives that can be used in the present invention, standard pressure-sensitive adhesives can be used and the composition is not especially limited, but, from the standpoint of optical properties, acrylic type adhesives are desirable.

The pressure-sensitive adhesive film of the present invention can be produced by coating or laminating a pressure-sensitive adhesive onto a release film or base film and applying a release film to the above-mentioned pressure-sensitive adhesive on the base film. In this case, it is desirable when thorough drying is carried out in such a manner that a heating loss of 1% or less, preferably, 0.5% or less occurs, when a heat treatment at 100°C for 2 hours is carried out, so as to prevent residual air bubbles or subsequent formation of air bubbles. Furthermore, the thickness of [the pressure-sensitive adhesive] varies depending on the height of the emboss, and in general, a height in the range of 10~50 μm is adequate.

Entrapment of air does not take place in the pressure-sensitive adhesive film of the present invention at the time of application; thus, an excellent pressure-sensitive adhesive (adhesive) surface can be produced and it is especially suitable as a [pressure-sensitive adhesive] film for use in the optical field.

For examples of base films used in the optical field, ultraviolet shielding films, heat shielding films, color adjustment films, polarizing films, etc. can be mentioned and pressure-sensitive adhesive films made of the above-mentioned films are cut to the appropriate size and used for sun glasses, safety glasses, ultraviolet filters, etc. Furthermore, in the case of polarizing films, the film can be used in combination with

liquid crystal cells for liquid crystal displays.

Furthermore, formation of air bubbles does not occur in the pressure-sensitive adhesive film of the present invention even when the film is used for applications wherein high temperatures and high humidity are present.

In the following, the present invention is explained in detail with application examples.

Reference Example 1 (Production of embossed release sheet)

A commercial biaxially drawn polypropylene film (thickness 100 μm) was used and an embossing was performed at approximately 80°C with an emboss roll having the pattern shown in Fig. 1. Furthermore, a silicon resin type release agent was coated on the above-mentioned film, and baking was performed to produce release film A having a mean height of the raised portion and recessed portion of 8 μm.

Meanwhile, a biaxially drawn polyethylene terephthalate film having a thickness of 50 μm was used and embossing was performed (at approximately 120°C) in such a manner that the emboss pattern shown in Fig. 3 was produced, and a release film U having a mean height of the raised area and recessed area of 3 μm was formed. In this case, the height of the raised area and the recessed area was measured by a surface roughness meter using the tracer method.

Application Example 1

An acrylic type pressure-sensitive adhesive (product of Kigawa Chemical Co., Daia-Bond DA-672 (registered trademark), 5% of curing agent added) was coated onto the

embossed surface of the above-mentioned release film A using a roll coater, and dried in a drying furnace for approximately 15 minute set at a temperature of 90°C. The mean coating thickness of the pressure-sensitive adhesive after drying was 20 μ, and the heating loss under conditions of 100°C x 2 hours was 0.7%. A commercial polarizing film (product of Sanritsu Electric Co., Bari-Light L-82-18) was applied via the above-mentioned pressure-sensitive adhesive layer using a lamination roller under a pressure of approximately 4 Kg/cm^2 so as to produce a pressure-sensitive adhesive polarizing film.

The above-mentioned release film was removed from the pressure-sensitive adhesive film produced and the film was applied to a commercial liquid crystal cell (surface glass sheet) via a pressure-sensitive adhesive layer with a hot press roll at 50°C. Air bubbles were not present at the above-mentioned adhesive interface and air bubbles were not observed even after storage at 80°C for approximately one month.

Application Example 2

[p. 3]

An acrylic type pressure-sensitive adhesive (product of Kigawa Chemical Co., Daia-Bond DA-3294 (registered trademark), 2% of curing agent added) was coated onto the above-mentioned release film U using a roll coater, and dried for approximately 10 minutes at a temperature of 120°C. The mean coating thickness of the pressure-sensitive adhesive after drying was 30 μ, and the heat loss under conditions of 100°C x 2 hours was 0.3%. The above-mentioned polarizing film used in Application Example 1 was applied using a laminating roller under a pressure of approximately 5 Kg/cm^2 so as to produce a pressure-sensitive adhesive polarizing film.

The above-mentioned release film was removed from the pressure-sensitive adhesive film and when the film was applied to a commercial liquid crystal cell, air bubbles were not present in at the above-mentioned adhesive interface; furthermore, air bubbles was not observed even after storage at 80°C for approximately one month.

Comparative Example 1

A commercial biaxially drawn PET film was used as the release film and coating and drying were carried out for the flat surface as in the case of Application Example 1, and lamination of the above-mentioned polarizing film was carried out to produce a pressure-sensitive adhesive polarizing film.

The release film was removed from the above-mentioned pressure-sensitive adhesive film and when the film was applied to the liquid crystal cell as above, many air bubbles were included. Furthermore, when [the above-mentioned film] was used to assemble a

liquid crystal display device, the image produced was not clear.

4. Brief description of figures

Fig. 1~Fig. 3 are partial enlargements of the emboss patterns used for the release film. The lines in the figures represent the raised portions.

Applicant Mitsui Toatsu Chemical Corp.

[*Translator's note: Product names in this translation are spelled phonetically.*]

Fig. 1

Fig. 2

Fig. 3

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⑤4 粘着フイルム

⑦2 発明者　名古屋市緑区有松町大字桶狭間字生山49－2
藤生順一

⑦1 特願　昭57－188228
⑦2 出願　昭57(1982)10月28日
⑦2 発明者　名古屋市南区滝春町５番地
⑦2 発明者　細沼信

⑦2 発明者　巻口浩
茅ケ崎市堤124－15Ｆ－14－５
⑦1 出願人　三井東圧化学株式会社
東京都千代田区霞が関３丁目２番５号

明　細　書

1. 発明の名称

粘着フイルム

2. 特許請求の範囲

剥離フイルム、粘着剤層および基材フイルムからなる粘着フイルムであつて、該剥離フイルムが高さ１～１５μm の連続した凸線状にエンボス加工されている合成樹脂フイルムであることを特徴とする粘着フイルム。

3. 発明の詳細な説明

本発明は粘着フイルム特に光学用途に適する粘着フイルムに関する。

従来から光学用途に用いられる粘着フイルムは、基材フイルム、粘着剤層および剥離フイルムからなり、その使用にあたつては粘着フイルムを所望の形状に切り取り、剥離フイルムを剥離してから被着物に貼り付けられる。その剥離フイルムとして通常表面が平滑な合成樹脂フイルムが用いられ、粘着剤層の接着面が平滑にためため被着物にぴつたりと貼り付けば光学的に良好な接着面が得られる。しかし、多くの場合、貼り付け操作をよほど適切にしないと接着面に空気を巻き込む欠点があり、一度貼り付けたものからこの空気を除くのは非常に困難である。

本発明者らは粘着フイルムを被着材に貼り付ける際に空気を巻き込まない方法につき鋭意検討したところ、従来の粘着フイルムでは余りにも粘着面が平滑すぎる点に問題があることを見い出し、更に研究を重ね遂に本発明を完成するに至つた。

即ち、本発明は、剥離フイルム、粘着剤層および基材フイルムからなる粘着フイルムであつて、剥離フイルムが高さ１～１５μm の連続した凸線状にエンボス加工されている合成樹脂フイルムであることを特徴とする粘着フイルムを提供するものである。

本発明に用いる剥離フイルムとしては通常剥離フイルムとして用いられる合成樹脂フイルムでよく、剥離面がシリコン処理されているもの

が好ましい。本発明においては、この剥離面に高さ1～15μm、好ましくは2～10μmの連続した凸線状に全面がエンボス加工されていることが必須である。この連続した凸線が粘着剤層の粘着面（被着材との接着面）に転写され、連続した凹線を形成する。この凹線（溝）があることにより貼りつけに際し、空気の巻込みを防止し、また巻き込まれた空気の除去が容易に行なえるのである。この凸線状の高さが1μm以下であるとその効果になく、15μmを超えると粘着（接着）面に空気が残るとともに粘着剤層に歪みが生じ、光学用途に用いると問題が生じる。エンボスの形状については、連続した凸線状が形成されればよく、その具体的な例を第1図～第3図に示す。図中の線部が凸状になったところである。

本発明に用いる粘着剤としては、通常用いられる粘着剤ならばその組成を問わないが、その光学的特性からアクリル系のものが好ましい。

本発明の粘着フイルムは、粘着剤を剥離フイルム又は基材フイルムの上に塗布あるいはラミネートし、次いで基材フイルム又は剥離フイルムをその上に圧着することにより得られる。その際、粘着剤層に気泡が残存あるいは後から発生しないように、100℃で2時間加熱した時その加熱減量が1%以下好ましくは0.5%以下になるように充分乾燥されていることが望ましい。又、その厚みは用途、エンボスの高さにより異なるが通常10～50μmで十分である。

本発明の粘着フイルムはその貼りつけ時に空気の巻き込みがないため粘着（接着）面が良好であり、特に光学分野に用いられる場合には好ましいものである。

光学分野に用いられる基材フイルムについて例示すると、紫外線カットフイルム、熱線カットフイルム、可変色フイルム、偏光フイルム等種々あり、これらから作られた粘着フイルムはその用途に応じて適当に切断され、サングラス、防眩ガラス、紫外線フイルター、等に用いられる。また、偏光フイルムにおいては、液晶セルとの組み合せで液晶表示装置とされ非常に有用なものである。

また、本発明の粘着フイルムは高温、高湿にさらされる用途に使用されても気泡の発生の心配がなく、特に有利なものである。

以下、実施例により本発明を説明する。

参考例1.（エンボス加工剥離紙の製造）

市販の二軸延伸ポリプロピレンフイルム（厚み100μm）を用い、第1図に示すようなエンボス模様が表出するエンボスロールを用いて、約80℃でエンボス加工した。更に、この上にシリコン樹脂系剥離剤を塗布、焼付けして山と谷の高さが平均8μmの剥離フイルムAを得た。

一方、厚み50μmの二軸延伸ポリエチレンテレフタレートフイルムを用い、第3図に示すようなエンボス模様とたるようにエンボス加工し（約120℃）、前述のシリコン処理を施し、山と谷の高さが平均3μmの剥離フイルムBを得た。なお、山と谷の高さは、触針型表面あらさ計を用い測定したものである。

実施例1

剥離フイルムAのエンボス加工面に、アクリル系粘着剤（キガワケミカル製"ダイアボンドDA-672"（商標）、硬化剤5%添加）をロールコーターを用いて塗布し、90℃に設定した乾燥炉で約15分乾燥した。乾燥後の塗布厚みは平均20μで、100℃×2時間での加熱減量は0.7%であった。この粘着剤層を介して市販の偏光フイルム（三立電機製パリライトL-82-18）を約4kg/cmの押圧力を有するラミネートローラーで貼り合せ、粘着性偏光フイルムを得た。

この粘着性フイルムより剥離フイルムを剥離し、市販の液晶セル（表面ガラス板）に粘着層を介して、50℃の加熱押圧ロールで接着したこの接着界面には全く気泡が認められず、また80℃で約1ケ月放置した後も気泡の発生を認めなかった。

実施例2

剥離シートBを用いて、アクリル系粘着剤（

ヨガワケミカル製"ダイアボンドDA-3294"（商標）、硬化剤2%添加）をロールコーターで塗布し、120℃で約10分乾燥した。乾燥後の塗布厚みは平均30μmで、100℃×2時間の加熱減量は0.3%であった。この粘着層側に、実施例1と同じ市販の偏光フイルムを約5 kg/cm の押圧ロールでラミネートし、粘着性偏光フイルムを作成した。

この粘着フイルムより剥離フイルムを剥した後、市販の液晶セルに押圧ロールで接着したところ、同界面には全く気泡が存在せず、80℃で約1ケ月放置後も気泡の発生を認めなかった。

比較例1

市販の二軸延伸PETフイルムを剥離フイルムとして用い、表面が平滑なままで実施例1と同様に同粘着剤を塗布、乾燥した後、同偏光フイルムをラミネートし粘着性偏光フイルムを作成した。

この粘着フイルムから剥離フイルムを剥し、同様に液晶セルに接着したところこの接着面に微気泡が多数残っていた。また、液晶装置に組込んだ場合像が不鮮明であった。

4.図面の簡単な説明

第1図～第3図は剥離フイルムのエンボス加工の例を示す部分拡大図である。図中の線のところが凸状になっていることを示す。

特許出願人　三井東圧化学株式会社

第1図

第2図

第3図